SOUTH CAROLINA Energy Office

ENERGY BRIEFS

Helping the Homeowner Live Energy Efficiently

Selecting a New Water Heater

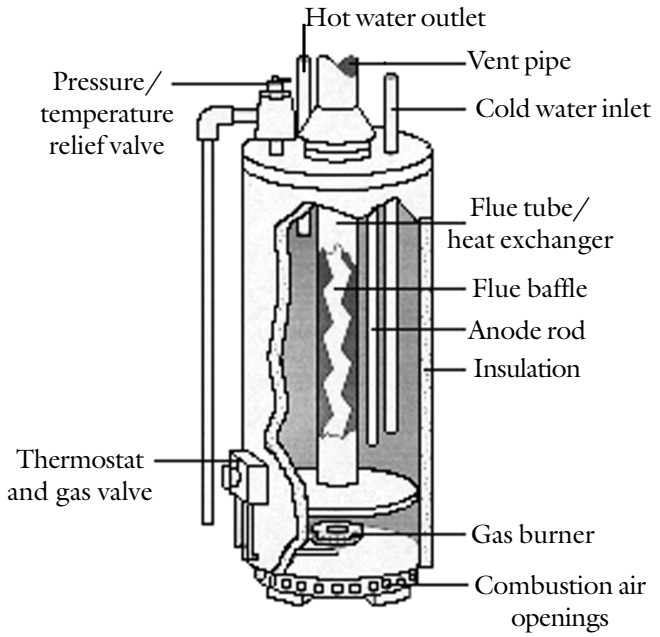
Many homeowners wait until their water heater fails before shopping for a replacement. Because they are in a hurry to regain their hot water supply, they are often unable to take the time to shop for the most energy-efficient unit for their specific needs. This is unfortunate because the cost of purchasing and operating a water heater can vary greatly, depending on the type, brand, and model selected and on the quality of the installation.

To avoid this scenario, you might want to do some research now before you are faced with an emergency purchase. Familiarize yourself today with the options that will allow you to make an informed decision when the need to buy a new water heater arises.

Types of Water Heaters Available

Within the last few years, a variety of water heaters have become available to consumers. The following types of water heaters are now on the market: conventional storage, demand, heat pump, tankless coil, and indirect.

Storage Water Heater



Storage water heaters remain the most frequently used type of water heater for residential purposes.

It is also possible to purchase water heaters that can be connected to your home's space-heating system, as well as solar water heaters.

Storage Water Heaters

A variety of fuel options are available for conventional storage water heaters - electricity, natural gas, oil, and propane. Ranging in size from 20 to 80 gallons, storage water heaters remain the most popular type for residential heating needs in the United States. A storage heater operates by releasing hot water from the top of the tank when the hot water tap is turned on. To replace that hot water, cold water enters the bottom of the tank, ensuring that the tank is always full.

Because the water is constantly heated in the tank, energy can be wasted even when no faucet is on. This is called standby heat loss. Newer, more energy-efficient storage models can significantly reduce the amount of standby heat loss, making them much less expensive to operate. To determine the most energy-efficient model, consult the EnergyGuide label required on storage water heaters. EnergyGuide labels indicate either the annual estimated cost of operating the system or energy efficiency ratings.

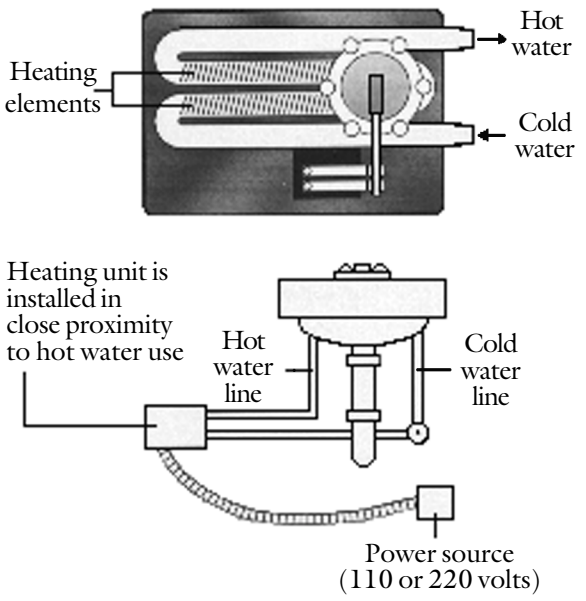
South Carolina Energy Office * 1201 Main Street, Suite 820 * Columbia, SC 29201
(803) 737-8030 * 1-800-851-8899 * Fax (803) 737-9846 * http://www.state.sc.us/energy

Demand Water Heaters

It is possible to completely eliminate standby heat losses from the tank and reduce energy consumption 20% to 30% with demand (or instantaneous) water heaters, which do not have storage tanks. Cold water travels through a pipe into the unit, and either a gas burner or an electric element heats the water only when needed. With these systems, you never run out of hot water. But there is one potential drawback with demand water heaters -- limited flow rate.

Typically, demand heaters provide hot water at a rate of 2 to 4 gallons per minute. This flow rate might suffice if your household does not use hot water at more than one location at the same time (e.g., showering and doing laundry simultaneously). To meet hot water demand when multiple faucets are being used, demand heaters can be installed in parallel sequence. Although gas-fired demand heaters tend to have higher flow rates than electric ones, they can waste energy even when no water is being heated if their pilot lights stay on. However, the amount of energy consumed by a pilot light is quite small.

Electric Demand Water Heater



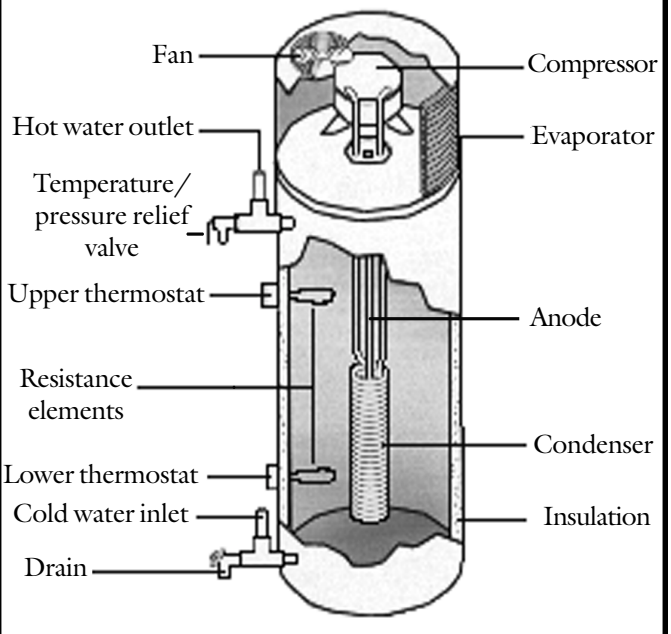
Because demand water heaters have no storage tanks, standby heat losses are completely eliminated.

Heat Pump Water Heaters

Heat pump water heaters use electricity to move heat from one place to another instead of generating heat directly. To heat water for homes, heat pump water heaters work like refrigerators in reverse.

Heat pump water heaters can be purchased as integral units with built-in water storage tanks or as add-ons that can be retrofitted to an existing water heater tank. These systems have a high initial cost. They also require installation in locations that remain in the 40-degree to 90-degree F range year-round and contain at least 1000 cubic feet of air space around the water heaters. To operate most efficiently, they should be placed in areas having excess heat, such as furnace rooms. They will not work well in a cold space.

Heat Pump Water Heater



Although they can have a high initial cost, heat pump water heaters have the potential to reduce water-heating costs by as much as 50 percent.

Tankless Coil and Indirect Water Heaters

A home's space-heating system can also be used to heat water. Two types of water heaters that use this system are tankless coil and indirect. No separate storage tank is needed in the tankless coil water heater because water is heated directly inside the boiler in a hydronic (i.e., hot water) heating system. The water flows through a heat exchanger in the boiler whenever a hot water faucet is turned on. During

colder months, the tankless coil works well because the heating system is used regularly. However, the system is less efficient during warmer months and in warmer climates when the boiler is used less frequently.

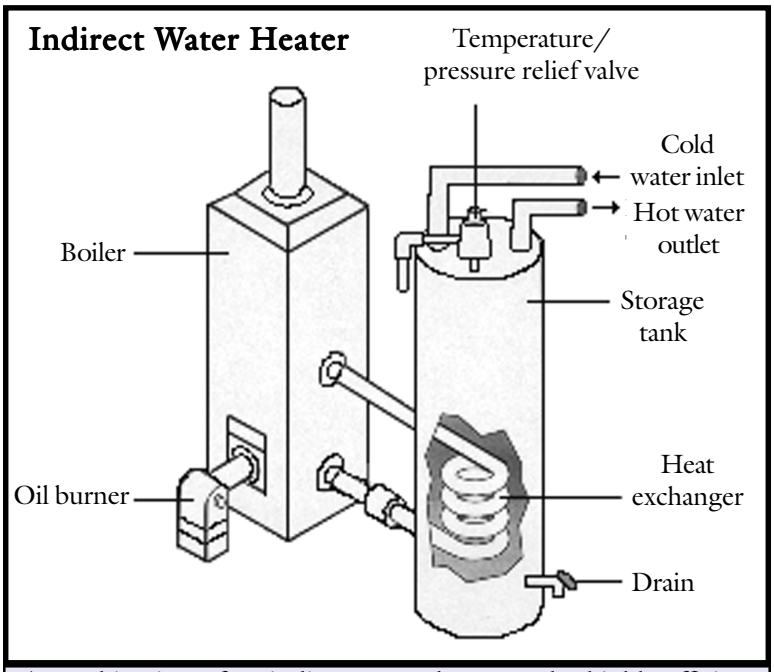
A separate storage tank is required with an indirect water heater. Like the tankless coil, the indirect water heater circulates water through a heat exchanger in the boiler. But this heated water then flows to an insulated storage tank. Because the boiler does not need to operate frequently, this system is more efficient than the tankless coil. In fact, when an indirect water heater is used with a highly efficient boiler, the combination may provide one of the least expensive methods of water heating.

Criteria for Selection

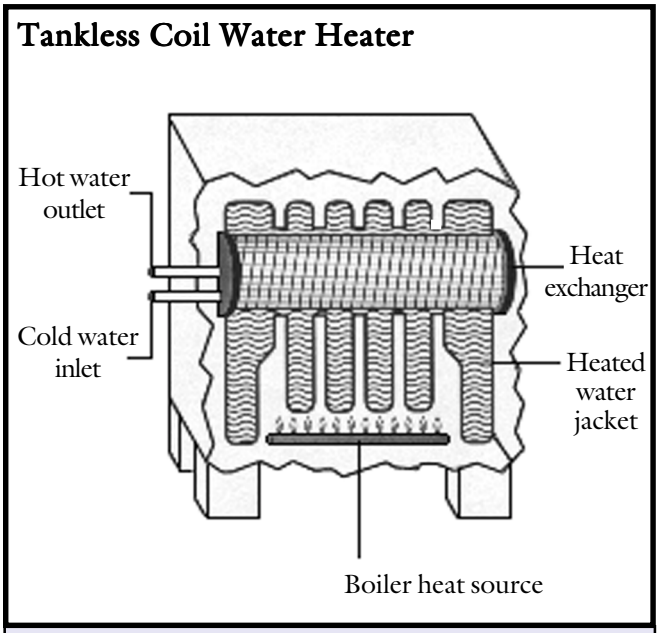
As with any purchase, balance the pros and cons of the different water heaters in light of your particular needs. There are numerous factors to consider when choosing a new water heater. This publication has already described different system configurations. Some other considerations are capacity, efficiency, and cost.

Determining Capacity

Although some consumers base their purchases on the size of the storage tank, the peak hour demand capacity, referred to as the first-hour rating (FHR) on the EnergyGuide label, is actually the more important figure. The FHR is a measure of how much hot water the heater will deliver during a busy hour, and it is required by law to appear on the unit's EnergyGuide label. Therefore, before you shop, estimate your household's peak hour demand and look for a unit with an FHR in that range.



A combination of an indirect water heater and a highly efficient boiler can provide a very inexpensive method of water heating



A tankless coil water heater uses a heat exchanger in the boiler to heat water

Gas water heaters have higher FHRs than electric water heaters of the same storage capacity. Therefore, it may be possible to meet your water-heating needs with a gas unit that has a smaller storage tank than an electric unit with the same FHR. More efficient gas water heaters use various nonconventional arrangements for combustion air intake and exhaust. These features, however, can increase installation costs.

Rating Efficiency

Once you have decided what type of water heater best suits your needs, determine which water heater in that category is the most fuel-efficient. The best indicator of a heater's efficiency is its Energy Factor (EF), which is based on recovery efficiency (i.e., how efficiently the heat from the energy source is transferred to the water), standby losses (i.e., the percentage of heat lost per hour from the stored water compared to the heat content of the water), and cycling losses.

The higher the EF, the more efficient the water heater. Electric resistance water heaters have an EF between 0.7 and 0.95; gas heaters have an EF between 0.5 and 0.6, with some high-efficiency models around 0.8; oil heaters range from 0.7 to 0.85; and heat pump water heaters range from 1.5 to 2.0. Product literature from manufacturers usually gives the appliance s EF rating. If it does not, you can obtain it by contacting an appliance manufacturer association (see Source List).

Some other energy efficiency features to look for are tanks with at least 1.5 inches of foam insulation and energy efficiency ratings shown on the EnergyGuide labels.

Comparing Costs

Another factor uppermost in many consumers' minds is cost, which encompasses purchase price and lifetime maintenance and operation expenses.

When choosing among different models, it is wise to analyze the life cycle cost -- the total of all costs and benefits associated with a purchase during its estimated lifetime. More information on conducting life-cycle cost analyses is available from EREC.

Units with longer warranties usually have higher price tags, though. Often, the least expensive water heater to purchase is the most expensive to operate.

Source List

South Carolina Energy Office
1201 Main Street, Suite 820
Columbia, SC 29201
(803)737-8030
(800) 851-8899
Fax (803) 737-9846
www.state.sc.us/energy/

The Energy Efficiency and Renewable Energy Clearinghouse (EREC):
P.O. Box 3048
Merrifield, VA 22116
(800) 363-3732
Fax: (703) 893-0400
E-mail: doe.erec@nciinc.com
www.eren.doe.gov/erec/factsheets/factsheets.html

EREC and the SC Energy Office provide free general and technical information to the public on the many topics and technologies pertaining to energy efficiency and renewable energy.

American Council for an Energy-Efficient Economy (ACEEE)
1001 Connecticut Avenue, NW, Suite 801
Washington, DC 20036
(202) 429-0063
www.aceee.org/
ACEEE provides general and technical information on energy efficiency, including these publications: The Consumer Guide to Home Energy Savings, The Most Energy-Efficient Appliances, *and S*aving Energy and Money with Home Appliances.

Gas Appliance Manufacturer's Association, Inc. (GAMA)
2107 Wilson Blvd., Suite 600
Arlington, VA 22201
(703) 525-7060
Fax: (703) 525-6790
www.gamanet.org
GAMA has information on residential gas appliances and equipment, electric and oil-fired water heaters, and oil-fired warm air furnaces.

Solar Rating & Certification Corporation (SRCC)
c/o FSEC
1679 Clearlake Road
Cocoa, FL 32922-5703
(407) 638-1537
Fax: (407) 638-1010
www.solar-rating.org
E-mail: srcc@fsec.ucf.edu
SRCC publishes the thermal-performance ratings of solar energy equipment. The SRCC offers a directory of certified solar systems and collectors as well as a document (OG-300-91) that details the operating guidelines and minimum standards for certifying solar hot-water systems.

Florida Solar Energy Center (FSEC)
1679 Clearlake Road
Cocoa, FL 32922-5703
(407) 638-1000
Fax: (407) 638-1010
www.fsec.ucf.edu
E-mail: info@fsec.ucf.edu
FSEC is an alternative energy center. The FSEC staff conducts research on a range of solar technologies, offers solar energy workshops, and distributes many free publications to the public.

Association of Home Appliance Manufacturer's (AHAM)
Suite 402, 1111 19th St., NW
Washington, DC 20036
AHAM provides energy efficiency information for specific brands of major appliances. The association also runs a certification program for certain types of appliances.